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THE FOUNDRYMEN'S ASSOCIATION*

The Pig Iron Syndicate System of Germany, the Pig Iron Warrant System of Great Britain, and the Method of Selling Pig Iron in the United States.

WITH COMMENTS ON EACH.

By GEORGE H. HULL.

In considering the methods of conducting the pig iron business in the three most important iron producing countries, it might be well to first review the nature of this business in the United States, that we may better judge of what particular system will meet the exact demands of the business in this country.

Each decade in the history of pig iron consumption in the United States marks an enormous increase. This increase does not come with regularity; on the contrary, it presents a succession of long periods, covering several years, when the consumption remains about the same, with prices ruling so low that many furnaces are forced out of blast and into the hands of the sheriff. This is followed by short periods of a few months, when the consumption increases from fifty to one hundred per cent. In these seasons of great consumptive activity, it is impossible to increase the output to meet the demands. There is a famine in all iron and steel products, which causes expensive delays in important enterprises. Prices advance to enormous figures; many concerns

*This paper was read at the February meeting of the different Foundrymen's Associations under the new arrangement by which the papers are discussed simultaneously.

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which have large contracts and small stocks, find themselves actually paying more for their raw material than they are to get for the finished product. They hardly get their business shaped up to meet the new conditions, before prices go tumbling down again, spreading loss and disaster on every side, to be followed by another long period of depression.

Iron is so thoroughly the basis of all industries, that what affects it must affect all manufacturing business.

The question, therefore, which most concerns every consumer of pig iron, is, what system will insure the greatest regularity in supply, with most stability in price?

An ideal system to fit such conditions, would be the existence of some group of individuals, with vast wealth, who would come forward and buy from the producers, for cash, at fair prices, all the surplus iron made during the several years of small consumption, and then in turn, during the recurring seasons of great manufacturing activity, resell it to the consumers.

Which system most nearly resembles this ideal?

GERMAN SYNDICATE SYSTEM.

The pig iron business of Germany is conducted by a syndicate or association of the individual producers. The leading idea of its organizers was to do away with needless and ruinous competition among themselves. At the time of its formation, it was made quite clear, that the organization did not wish, or intend, to enhance prices to the consumers in an oppressive way.

At the beginning, each member was required to file a statement of his or their production for a number of years, and the average annual production of each, as thus shown, was made the basis of the percentage of production allowed to each company from time to time. When the demand for iron falls off, the total production of the furnaces is cut down accordingly; when the demand increases, the total production, as far as the capacity of the furnaces permits, is increased to conform to the greater demand. As it is not always practical for each company to cut down production to meet the arbitrary percentage ordered, the

difficulty is met by a payment, by the syndicate, to the furnace company which makes less than its allotment, and by a corresponding collection from the furnace company, which makes more than its allotment.

In order to keep the respective parties to their agreements, each individual or company, on being admitted to membership, is required to deposit with the syndicate bank, an accepted sight bill for a certain amount, with the condition that said sight bill is to be forfeited to the syndicate, if the conditions of the agreement are violated by the members depositing it.

The syndicate has one office. All inquiries for iron from consumers and dealers must be addressed to this office, and no member is allowed to sell, except throuh this channel. The syndicate purchases all supplies for its members; it fixes the price for the different qualities of iron from time to time; it will sell for delivery six or twelve months ahead, or longer, to meet special requirements.

The system has resulted in a large reduction in the expense of selling iron, and in a very considerable saving in the purchasing of supplies. It has entirely done away with ruinous competition, and has maintained prices which have been fairly remunerative to the producers.

There are objections to the system. It puts all the power in the hands of the producers, a power which is at any time liable to be abused. It is artificial. It is not the result of free and untrammeled operation of natural laws. It is a forced condition, held together by an agreement which is maintained by the fear of forfeits and penalties.

History does not furnish a single example of any business system, formed and maintained by such methods, which has endured. The serious defect of the system lies in the fact that it not only lacks a method of accumulating and carrying a reserve stock in dull times, but its chief object is to prevent such an accumulation.

A system which restricts the production of the article most necessary to the growth of the country in wealth and power, is

arrayed against the public good, and should be prohibited by national law.

BRITISH WARRANT SYSTEM.

The British Warrant System originated in Scotland about the year 1840, though no statistics of same have been preserved farther back than 1845. Briefly stated, the warrant system is to the pig iron business what the elevator system is to the grain business, and what the public warehouse system is to the cotton business.

The functions of a warrant company are few and simple; it receives into its yards pig iron, which it has previously weighed, inspected and classified, and for which it gives to the owner of the iron a warrant. This warrant is simply a negotiable warehouse receipt, which describes the brand, quality, and weight of the iron it represents, and guarantees or warrants, that on return of the warrant duly endorsed, and payment of storage, it will deliver the iron it describes, free on board cars, to the party presenting said document.

A warrant company performs no other acts or functions, but the effect of these acts is to create a document, which the furnace company can sell for cash, and which can be transferred by sale, any number of times, each purchaser becoming the owner of the iron, by the transfer of the document, each purchaser having the right to re-sell the warrant, or to cancel it and obtain the iron for export, consumption, or any other desired purpose.

At first, the Scotch warrant consisted of scrip, or storage receipts, issued by the pig iron makers, for the convenience of dealers, but so many irregularities occurred, that it was found necessary to have the iron stored in the yards of an independent firm of undoubted standing. The firm of Connal & Co., now Connal & Co., Limited, inaugurated the system of issuing the present "Storekeeper's Warrant."

For fifty years these warrants have been regarded as an absolute security; money is loaned upon them with confidence by every bank in the kingdom, the prevailing rate of interest being one-half of one per cent per annum above the Bank of England

rates, which is a rate enjoyed only by the most favored collateral. The semi-daily dealings in these warrants is the prominent feature on the floor of the Royal Exchange of Glasgow. The warrants are bought and sold, not only by the iron producer, consumer, and merchant, but by the general public; it is, in fact, the favorite security among all classes who buy and sell for a profit, and the dealings in consequence are enormous; there are more than seventy members of the Exchange who make a specialty of buying and selling warrants for the public.

The wheat certificate is the only security in the United States, which in popularity approaches the popularity of the pig iron warrant in Great Britain.

The statistics of the Scotch warrant system show that the average reserve stock of iron carried by that method during the last fifty years, has been more than six months' production; for one period of five years, it was more than twelve months' production. There have been six periods of accumulation and six periods of depletion of stock, and three times these large reserve stocks have been reduced to less than 100,000 tons. This is evidence that the seasons of accumulation were not seasons of over-production, since each accumulation was afterwards almost entirely exhausted by the legitimate business demands of the country.

It is no more over-production to make and store up enough iron in seven years of dullness, to supply the business of the country through two years of activity, than it is to raise and store up in a few weeks of harvest, enough grain to supply the country during twelve months of consumption, it simply requires a broader mind to take in the proposition.

Great Britain has been the country to which for a century all the world has looked for everything connected with iron. An English contractor will undertake a contract in a foreign country, which requires 50,000 tons of iron and five years to complete, as readily as an American contractor will take one which can be completed in a few months, simply because he can protect himself against fluctuations in price of iron and steel, through the warrant system. When such a contract is taken by the English contractor,

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he immediately closes a contract with his exchange dealer for warrants covering 50,000 tons, at the market price, which the dealer agrees to carry at two cents per ton per month storage and a low rate of interest, perhaps one and one-half per cent per annum. It may be a year before the contractor is ready to give an order for the first 10,000 tons of steel to be used in his work; when he gives the order, he sells an equal tonnage of his warrants. If the price of steel has advanced, the warrant iron has advanced; if iron has declined, he buys his steel at a corresponding decline; he is thus protected on each order he places for steel during the five years. By this means he eliminates all risk of fluctuations and confines his business to its legitimate profits.

The warrant system has no disadvantages, and no just argument can be made against it. There is no good thing, however, which cannot be misused. Some people have tried to corner the warrant market, and, as usual, been badly crippled in the attempt. These victims of their own folly have made an outcry against it, and made an effort to have the system abolished by parliament. They were like the few frogs in the pond, which made so much noise it was thought there were a million, but when the round-up took place it discovered the three loneliest men who ever arrayed themselves against a nation. It would be just as reasonable to ask parliament to abolish razors, because a few people have been known to cut their throats with them. The effect of these corners upon those who were engaged in the legitimate business of producing, consuming or dealing, was simply to give them an opportunity of unloading all their surplus on the ring, at high prices, while the corner lasted, to be bought back the next month at a handsome profit.

The legitimate price of a staple must and always will assert itself, by and through the actual business doing in that staple. Speculative interference has had, and can have, only a temporary influence.

An argument used against the system by some of its opponents, is that it creates a collateral on which producers can easily borrow money from banks, and that parties have sometimes so

borrowed, and have increased and continued so borrowing on their product until they were ruined.

This argument is characterized by such intellectual depth and penetration that the only remedy we can suggest is that parliament be asked to abolish banks at the same time it does razors. It is of course a folly for any producer to pile up his product, and carry it for several years with interest and storage charges accumulating against it, for unless it advances enormously at the end, it is likely to terminate disastrously. The dealer, however, under modern exchange methods, may carry iron under these conditions, and make a handsome annual profit in so doing.

The opinions of prominent men in England and Scotland who have been identified with the iron business for a generation, can be summarized as follows:

The warrant system works beneficially in every respect, to both the producer and consumer. Through it the maker, even in dull times, finds a ready market for that portion of his product which is not taken promptly by the consumer or dealer. Through it the cosumer is brought, in effect, fact to face with every seller, be he producer, dealer or investor, and is thus able to buy to the best possible advantage. The producer who anticipates a decline, may sell his product for months or years ahead, take out warrants for it as made, and collect cash for his warrants as presented. The consumer, if he anticipates an advance, may provide for his requirements for months or years ahead, with certainty that the iron will be delivered to him immediately on presentation of his warrant. It has all the advantages of the syndicate system, without its disadvantages, and at the same time allows free scope to individual opinion and enterprise.

It is in fact a balance-wheel to the whole trade.

The system is not forced or artificial. It is of natural growth, built up by the free and untrammeled working of all the elements, through an experience of centuries. Neither party controls it. It does not tie the hands of any element. It is not maintained by any agreements which must be held together by forfeits and penalties. It has nurtured a body of strong, vigorous, self-sustaining

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producers and consumers. Its existence and growth has depended on its usefulness to the producer and consumer alike, and its continued existence for sixty years without change, while constant changes have taken place in the systems of other countries, is the best evidence that it meets the requirements of all the interests connected with the iron business.

Above all, it is an effective means, and the only means, through which large reserve stocks can be accumulated, without depressing prices. It is, in short, a working out, on sound and natural business principles, of the "ideal system" pictured in the opening of this paper.

AMERICAN METHOD OF SELLING IRON.

The pig iron business of the United States has been of such sudden growth, that it has not had time to crystallize into a system. The methods of to-day are simply what changing conditions and necessities have made them. In 1840 the total production was but 290,000 tons; at that time the iron was sold by furnace companies. Twenty years later it had only increased to 820,000 tons, and was still sold largely by the producer, but in the interim, through various causes, such as needy producers being obliged in dull times to pledge their iron for advances in money or supplies, the trade in the large cities had drifted partly into the hands of wholesale dealers in merchandise. The iron so pledged was first shipped from the furnace to the merchant, who hauled to yard and stored it, which necessitated a second hauling and shipment when it was finally sold to the consumers. This double handling added greatly to the expense, and the merchant having other business, gave only incidental attention to selling iron. The selling business being only half done, was poorly done.

Later on, the merchant's portion of the business went over to commission men, in consequence of the latter being able to give their whole attention to selling, but it was not until the commission agents abandoned the system of double handling, and inaugurated the system of making sales, to be filled by shipment directly from the furnace to the consumer, that the makers gave up selling it themselves, and turned the business over entirely to

the commission agents. When this method became general, the makers had agents in each important distributing center, and confined these agents to the territory most easily reached from such center. The number of agents was small and each one represented several different brands. Under this method the competition was greatly reduced, and was much less destructive to profits than when the makers sold part of their own output. There were at this period some 600 producers, and yet the competition was confined to from two to half a dozen agents in each territory.

Later on, when the agents became stronger financially, and were able to aid their principals, these stronger concerns secured exclusive agencies, with authority to sell in all territories; this increased the competition greatly, as each territory was invaded by the agents from several other territories; the agents were compelled to employ many traveling salesmen in order to cover the larger fields, thus their own expenses were increased to such a dgree that their business yielded but little profit. This has resulted in the agents taking on other staples, such as coal, coke and the manufactured products of iron and steel, and more recently in becoming buyers and sellers on their own account, as well as becoming interested as producers.

In some important markets, like Pittsburg, the iron commission agents have already disappeared and been replaced by the dealers.

By these changes, the American methods are gradually working more nearly to the British system, under which the iron is handled principally by dealers, and it is a notable fact that the largest increase in business among iron sellers in this country has been with those who have been the largest buyers of warrants and iron on their own account; the fact of having something of their own, on which they could make instant quotation, giving them a great advantage over those who must consult a principal. A business must have some independence to insure its growth and permanence; the commission iron business, which is necessarily

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dependent on both buyers and sellers, has no independence, and is always hampered.

During all these changes in the American methods, many efforts have been made to form associations in the United States, similar to the German Syndicate System, but what has been practical in a country of 212,000 square miles, where the interests of all producers were similar, has been impossible in a country of 3,600,000 square miles, where the interests of the producers were so conflicting and varied.

At the present time such associations or syndicates are prohibited by United States law.

Thus for sixty years, through constant changes, the American producer has been struggling for some satisfactory method of marketing his product, and if, during that sixty years, there has been one producer or one consumer who has been satisfied with the methods in vogue, he has failed to make himself known to the world.

We hear of furnace companies building works to consume their product, because they cannot sell it to advantage, and we hear of consumers building furnaces to make their pig iron because they cannot buy to advantage, but we hear of no one who is satisfied with conditions as they are.

The methods in vogue have given to the American iron business only the experience of constant suffering; seven years when the makers are suffering for buyers, and two years when the consumers are suffering for sellers.

During all this time the iron business of Great Britain has been conducted under one system, and during ten years of correspondence with, and a month spent among the iron men of that country, we have never encountered one who did not consider their system a benefit to both producers and consumers.

Next to good government, there is nothing so important to the business welfare of any progressive nation, as an ample supply of iron and stability in its price.

Any condition which causes an advance of 100 per cent in the price of any important staple, is an evil; such an advance in the

price of pig iron, the staple on which our country most depends for its growth in wealth and power, is a calamity. All other things advance in sympathy, until they reach a figure which every thinking man knows cannot last; the greater the advance, the greater must be the decline, and the more disastrous must be the depression which follows.

Does anyone believe that the advances in all commodities would have reached the present enormous figures, if the advances in iron during the last twelve months had been confined to 10 or 15 per cent?

Keep the price of iron within reasonable bounds and you keep everything within bounds.

Let us have investors, dealers and speculators to buy the surplus in dull times, and it will rarely, if ever, go as low as cost again.

Let us have the reserve stock which these added elements will accumulate, to supply us in active times, and it will never again go up to such enormous figures.

The principal argument used against the adoption of the warrant system by its opponents in this country, is that the introduction of speculation into the iron business, will increase the fluctuation in its price, and yet statistics show directly the opposite effect has attended the introduction of all other articles to exchange dealings in the United States. Let us see if this has not also been the effect upon iron in Great Britain.

To answer this question we will take the official quotations of pig iron on the Glasgow Exchange, the birthplace and home of the warrant system, in contrast with the official quotations of the Cincinnati Chamber of Commerce, which most nearly represents the average price in this country, which had no warrant system during the period covered by the comparison.

When the price of iron reached $50 per ton in Cincinnati in 1854, it represented an advance of 163 per cent, the advance in Glasgow at the same time was 45 per cent. When iron reached $80 per ton in Cincinnati in 1864, it represented an advance of 344 per cent, the advance in Glasgow at the same time was 37 per

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cent. When iron advanced to $59 in Cincinnati in 1872, it advanced to but $34.50 in Glasgow. When iron reached $44 in Cincinnati in 1880, it represented an advance of 125 per cent, the advance in Glasgow at the same time was 60 per cent.

The main argument against the system has therefore no foundation to stand upon.

With the great advantage afforded by the British system, and the disadvantages caused by our want of system, it may seem strange that the warrant system was not adopted in this country forty years ago, but every business, like every individual, must go through a period of development, and this takes time and experience. It is no more possible for a small or new business to adopt mature methods of administration, than it is for a youth to assume the mature manners of the adult.

The iron business of Great Britain is several hundred years old; it was a strong, vigorous adult when the iron business of America was a puny infant. The methods in vogue for the last fifty years in the iron business of America had been tried and were discarded by Great Britain more than half a century ago. The exchange system is simply the final refuge of each business as it expands and discards old and inadequate methods. It is in effect simply creating a negotiable paper representative of the article to be dealt in, and then bringing, at a given time and place, everyone who wishes to buy, face to face with everyone who wishes to sell that article.

Human ingenuity has not yet discovered a method more nearly perfect for controlling a business of great magnitude.

Every business which reaches great magnitude necessarily comes to the warehouse and exchange system. It is the only method which has stood the test of time, and which is surely adopted after all other experiments have failed and been abandoned. The plan of accumulating stocks in time of plenty, instead of slaughtering them, has been taken advantage of by dealers in almost everything except pig iron. Only a few years ago there were seasons when the receipts of fruit in the city of New York were sometimes so great within a few days, and the

prices were forced so low, that the fruit hardly brought the amount of freight; this in turn discouraged shipments, and then would succeed a season of great scarcity. It took experience and many years of loss to rectify this condition, but finally it resulted in the establishment of fruit exchanges and storage warehouses, where fruits were kept at a temperature just above the freezing point, where chemical change ceased, and thus it was preserved in a perfect condition for months.

The result is that prices are now more stable, the public is better served, and the profits of both producers and dealers are more uniform and remunerative. Thus, after many generations of waste, we have finally developed a fruit system. It does not limit production of fruit, and no matter how much arrives in a short time, only what the market will naturally take is offered, and the remainder goes to build up a reserve supply. So we find vegetables, eggs, butter, fish and poultry, as well as grain, cotton, provisions, coffee and many other articles, getting the benefit of a system, while iron is still left to drift in a haphazard way.

The American Warrant System has made a small beginning, but it has demonstrated the fact that it constantly absorbs surplus iron during the dull periods, and steadily gives up this stock when the country most needs it.

But warrant yards are only part of the warrant system; to make it complete, there must be daily exchange dealings of such magnitude, that buying and selling orders can always be promptly executed.

The system has been a benefit to those who have given it a fair trial. It has in many instances been the only channel through which needy furnace companies have been able to get money in times of great stringency, and has saved them from being obliged to blow out or bank their furnaces.

The reserve stock accumulated by this system, although small, has furnished the iron to tide over many a manufacturing concern during the last year, which, without it, must have suspended work

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at times when it would have caused them loss and great inconvenience.

It has been of the most pronounced benefit to such dealers as were the first to take hold of it. The growth of their business has been almost in exact proportion as they have dealt in warrants, not only in the domestic, but in the export business. In fact, no one appears to have made a success in the export business except those who have dealt in warrants.

For more than a century the commercial world has looked first to Great Britain for everything connected with iron. With her lower cost and large reserve stock, she has been able to maintain a stability in prices and supply, which has enabled her to control the markets of the world. The United States has for several years been the cheapest iron producing country in the world, and should have begun making large exports of iron long before she did, but for ten years her reserve stock has been less than twenty-three days' consumption. If we are in the future to have uninterrupted control of the iron markets of the world, we must carry enough stock to give stability to prices. The higher cost and reduced product of Great Britain has prevented her accumulating her usual reserve during the last few years, and will prevent this in future. The world's reserve supply in the future must be accumulated in the United States. The introduction of the Warrant System in this country has, therefore, been most timely.

British dealers have for eight years been among the largest holders of American warrants, and the introduction of them to exchanges in Great Britain is already under discussion. If dealings in American Warrants become centered in London or Glasgow, instead of New York, British dealers will still control the iron markets of the world, even after the principal supply comes from this country.

Since the dawn of civilization, the importance of storing up stocks of such things as were necessary to the life, defense and well being of man, has been recognized by all nations and people. The Scriptures, from Genesis to Revelation, abound in accounts

of the immense store houses and store cities builded and maintained by the great nations of ancient times. They not only gathered in the months of harvest, sufficient to supply the people until the next harvest, but they stored up, in years of plenty, sufficient to provide for the years of famine. This wise provision ranked first in importance in all temporal affairs.

REVIEW OF THE FOUNDRY LITERATURE OF THE MONTH.

IRON AGE.

A feature of the increased chances for employment brought about by the present activity is dealt with as follows:

In these prosperous times, with wages so generally advanced, and workmen earning far more than they were previously able to get for many years, labor troubles should be few and far apart. Golden days are now being enjoyed by employers and employees. Factories and mines are running to their full capacity instead of half time or intermittently, and earnings are piling up monthly as they have not previously done for a long period. Taking some branches of manufacturing, the wages now paid may almost be considered phenomenally high. In the rolling mills, for instance, recent adjustments in conformity with the wages scale have brought the rates paid to a higher point than for 20 years. We have had times in the past when such high rates were artificially maintained by strong labor organizations, but trade was dull and earnings were light because the mills could not be kept in constant operation. But now every wheel is turning and is likely to be kept moving for at least months to come. High rates of wages therefore mean large monthly earnings. It is a time when not only mill and mine owners are anxious to get every dollar of earning power from their operations, but when every workman would seem to be equally anxious to get the best possible results from his own efforts. These are the days when provision should be made by large savings for the slack times which are sure to come sooner or later. Activity in trade cannot be kept up continuously.

It is extremely desirable for many reasons that under existing conditions labor troubles should be avoided. The tension is great along the entire line, from the miner of the raw material to the ultimate consumer of the most highly finished product. Every link in the chain must stand the strain or trouble and confusion are caused to a long line of interdependent manufacturing and

commercial interests. Employers of labor feel the importance of the situation and the responsibility resting upon them of keeping customers supplied probably just as much as they appreciate the desirability of securing a steadily full output on account of the profits involved. They endeavor by all reasonable means to keep their workmen satisfied, and to remove possible causes of friction which might compel the stoppage of operations. Thus we quite frequently see reports of voluntary advances in wages, undoubtedly made for the purpose of promoting contentment and preserving peace and harmony.

But despite the efforts made to keep everything moving smoothly, we have at present a condition of perversity and uneasiness in some important lines which may lead to serious consequences if prudent counsel does not speedily prevail. It is, of course, assumed by those who are fomenting troubles of this character that the proper time to act is when business is brisk and a strong pressure is felt for all kinds of material. Employers may then concede a point or two rather than have operations suspended by a strike. But indications are visible of a pugnacious spirit among employers, especially among those managing important interests, and it is to be feared that the demands of labor when pushed too far will meet with such resistance as to considerably derange important branches of industry affecting wide areas. While labor leaders are active, the employers of labor are also on the alert.

A peculiar feature of the labor situation, which is certainly not promoting a more kindly feeling among employers, is the growing tendency among employes to slight their work. The fact has been alluded to before in these columns. It is strongly brought out in the following letter, which we have received from a large employer of labor in an important manufacturing city:

We know that we are getting the top of the market as to prices and that the work is put through the shop, to say the least, at less than the average cost, and that the non-productive expenses are as low as a plant of this size is run with anywhere, and still the net results are not what they should be as compared

with the business of 1898. We have practically no piece work, everything is done by the day's work, but we are not getting the work out of machines that we did about two years ago. This is true, too, of the foundry, in which it is nearly all day work. This and the high cost of raw material make the results far from satisfactory. One cause for the machines not turning out work as fast as they did a year or two ago is that quite a percentage of the men are unsteady and are changing from shop to shop. Before the rush our men were contented with one pay day a month and had been for 25 years. They made a request for two pay days early last spring and it was conceded. It simply means, to a great many of them, two sprees instead of one. They return after a pay day not fit for work, and we suffer in consequence. We are satisfied that we are no worse off in this respect than any of the other shops in this city, or, for that matter, any other place.

High wages and honest work should be compatible. High wages and full time should further be productive of contentment. It must regretfully be admitted that these are not axioms.

The Manufacturers' Defensive Organizations are referred to in the issue of February 8 as follows:

Attention has been freshly called by the convention of the National Founders' Association, held in Detroit last week, to the advanced position which manufacturers are now taking on the labor question. They are practically adopting the tactics of the workingmen, realizing that organization, with a reserve fund to back it, is essential if they wish to retain any considerable influence in the management of their business. The movement among manufacturers to form associations, with funds of their own, for the express purpose of dealing with labor, has been of slow growth. Pioneers have been in the field for many years, notably the Stove Founders' National Defense Association, but their success in the avoidance of strikes has not borne fruit in the formation of similar associations in other lines of manufacturing industry until quite recently. One of the most promising of these is the National Founders' Association, which has had remarkable growth. Although but two years old it has 275 members, among

whom are very many of the recognized leading foundrymen of the country, as shown by the list which is published elsewhere in this issue. This list of members may not seem large, as compared with the total of over 5,000 foundries, but it is claimed, and the claim is doubtless true, that of these foundries 500 melt over two-thirds of all the iron made into castings, and employ over two-thirds of the molders. Hence the membership of this association does not need to run into the thousands to make it of commanding influence in the settlement of labor questions, but simply to include as many of the leading foundries as possible. The stand they take upon a question of wages, hours of trade usage is very likely to be accepted as the basis to govern the entire trade.

Thanks to a very efficient corps of officers, ready to intrust their own business to others at the call of duty, this young association made a record for itself during the past year, settling quite a number of disputes in the molding trade. Further troubles of this character are likely to come up in the near future, as indications have already made their appearance. They will doubtless be handled in the same effective way. It is fortunate for the foundries, in these days of unrest among workingmen, that an organization of such a character had been established by the foundrymen in time to get into good working order, so as to handle the labor troubles brought about by prosperity. Otherwise it is believed that considerable embarrassment would have been experienced in numerous establishments by this time, which are now quite free from labor disputes. The success achieved by this association is quite remarkable, when the diversity of interests among the membership is considered. It includes makers of builders' hardware, railroad malleables, agricultural malleables, steel castings, machinery castings, light gray iron castings and specialties, as well as general merchant work, exhibiting such a varied line of products and therefore involving the employment of such distinct classes of workmen that the application of general principles as to labor would seem to be exceedingly difficult. But if any questions have been caused by such conditions of diversity they have evidently been happily solved, and a good ex-

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ample is here presented to be followed by employers of labor in other lines. It is possible to get together if the disposition to do so exists.

No one could be present at the deliberations and hear the discussions of the National Founders' Association without being forcibly impressed by the high principles actuating the members. Primarily driven by the aggressions of labor and the arbitrary attitude of labor leaders into forming an association for defensive purposes, that phase of the present situation was seldom brought out. Instead of hostility to the workingman and his efforts to secure additional advantages, a humane interest was shown in his welfare, and full recognition was accorded to his rights. When such subjects as the employment of apprentices and the drafting of workmen's contracts were discussed, it was not from the selfish standpoint of attempting to get the better of employes, but to secure fair dealing for all concerned, and thus promote the best interests of humanity. Evidently a deep sense of the great responsibility resting upon their shoulders was felt by the employers present in that assemblage, many of whom exercise authority in that capacity over hundreds of men. It was, therefore, with no light or trifling manner that they decided questions of policy or principles which were brought before them for determination. Without losing sight of the fact that they might at any time be forced to take stern measures to preserve their own rights and perhaps their own business existence, they showed that they were animated by higher motives than the endeavor to get the largest possible profit from the employment of other men. If all defensive organizations can be established and conducted upon the same high plane, the irrepressible conflict between capital and labor will be shorn of much of its unpleasantness.

Referring to the paper read by Mr. George H. Hull, on "Systems of Selling Pig Iron" before the Foundrymen's conventions, Mr. Willard S. Mattox, of Boston, offers the following comments thereon:

Mr. Hull dogmatizes when he asserts positively, "The warrant system has no disadvantages, and no just argument can be

made against it." Here he is wrong. There are many reasons why the Scotch warrant system should not be adopted here, and a few will be put forward. Since Mr. Hull's paper was given prominence before the monthly meetings of the American Foundrymen's Association, it is of equal importance that those most interested should know that there are objections to the institution advocated. Some fictitious objections are raised and answered to the satisfaction of the author, but these are altogether too irrelevant and out of harmony with the impressive tone of the rest of the article. The financial and economic features objectionable in Scotch warrants are kept in the background and American foundrymen are told only of the beauties of the system. The American foundryman is not told how much more he is liable to have to pay for his pig iron under the Scotch methods.

To begin with a monetary consideration, a simple mathematical calculation may serve to demonstrate one undesirable feature of Scotch warrants as they exist to-day in England. Let us take up a unit of quantity, a single warrant representing 100 tons; also a unit of time, one month; and for purposes of argument let us assume that the pig iron is worth $15 per ton, a fair average price. Now, under the Scotch warrant scheme, we have tabulated the following items:

One warrant, 100 tons at $15, value $1,500.	
Storage, rate of 1c per ton per month	$ 1 00
Interest, rate of 6 per cent. per annum, one month	7 50
Broker's commission, half of 1 per cent. on $1,500	7 50
Total	$16 00

This equals 16 cents per ton per month on this particular lot of iron, converted into warrants. Continue the process, on the supposition, based on statistics, that one warrant will change hands about four times per year. This means four brokers' commissions, or an item of $30, while the interest continues unchanged, making $90, and the storage $12 per annum, a total of $132 on the original $1,500 in one year. Thus each ton has been burdened with an additional expense of $1.32 in one year. It is

easy to see how soon, if the pig iron were left continuously in warrant form, the accumulated charges would equal the original value of the iron. This would, theoretically, wipe it out of existence—it might as well be at the bottom of Manila harbor. It has done no practical good, it has eaten itself up in a few years and remains only to be a means of speculation for a few, serving no good purpose in the general utility of the community or country. But say the metal is withdrawn from warrant yards at the end of the year—it still has its face value, and the buyer, the foundryman, pays the $1.32 accrued charges, as well as the usual commission which dealers or merchants extract. In other words, by the time the article emerges to be consumed it has artificially enhanced its value, or, rather, its cost, in addition to whatever ordinary rise of the market may have occurred.

One of the advantages of the Scotch warrant system is thus set forth by Mr. Hull: "A warrant company performs no other acts, or functions, but the effect of these acts is to create a document which the furnace company can sell for cash, and which can be transferred by sale, any number of times, each purchaser becoming the owner of the iron, by the transfer of the document, each purchaser having the right to resell the warrant, or to cancel it, and obtain the iron for export, consumption, or any other desired purpose."

It is true the immediate effect of the conversion of the metal into a negotiable warrant is to relieve the furnace company and place in its hands a capital it might not otherwise be able to command if obliged to store in its own yards. But this very benefit to the furnace is a menace to the consumer, because by passing into the hands of speculators the iron ceases to be a burden to the maker, who is no longer concerned as to the ultimate profit or loss attaching to it, his own profit having been assured. From the time it leaves the possession of the furnace it begins to incur charges, which it would not incur if still owned by the furnace. And who has to pay these extra charges? The foundrymen, the very class to whom the president of the American Pig Iron Stor-

age Warrant Company has addressed his arguments in favor of such an institution.

Continuing, the article urges that under the Scotch warrant system "it was found necessary to have the iron stored in the yards of an independent firm of undoubted standing." The necessity for an "independent firm," which is to store pig iron and issue certificates therefor, is not apparent in America. It introduces an additional link in the chain between maker and consumer, an extra maw to satiate, another drain on the profits, all of which means a loss to the ultimate purchaser, the foundryman. In the highest and most purely absolute economic order of existence there is but one step from producer to consumer. Any circumstance which increases these stages departs from the abstract ideal. In a complicated civilization such a primitive order is impossible, but the effort is and always should be not to push further away from its source of supply the consuming body, but by every legitimate process bring the two into closer touch, as close, in fact, as the economic conditions of the body politic will allow. Thus the present system of making and selling pig iron in the United States has eliminated some of the errors of the older English system; our methods are an improvement over the methods of selling by warrant; they are more natural, dependent on fewer influences, and advocacy of a return to conditions we have outgrown is either utilitarianism or ignorance of the essentials of the two schemes.

It is further urged that the Scotch warrant system, while not only relieving the furnace in dull times, will also serve to steady the market and prevent unusual fluctuations in price. The writer's observation of the working of the system in Scotland and England does not verify this. On the contrary, the speculative element introduced is just another factor in unsettling the markets. It frequently happens that with good demand and trade conditions lawfully on the side of prosperity, the Glasgow market has been manipulated downward, and the price of makers' iron, not in warrants, has been forced to follow, when it deserved to be shillings per ton higher. The Glasgow market is a gauge

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for buyers and sellers. No matter what the other conditions of the country may be, if warrants are up, iron is up, and the reverse. This means that the man who melts iron is at the mercy of a handful of brokers, who speculate with paper representing an article which may not be used in years, in addition to all other normal causes for fluctuations. This certainly does not prove that Scotch warrants have given to the English market any greater security or stability than our own enjoy.

American foundrymen were also told that "it is, of course, a folly for any producer to pile up his product and carry it for several years with interest and storage charges accumulating against it, for unless it advances enormously at the end, it is likely to terminate disastrously. The dealer, however, under modern exchange methods, may carry iron under these conditions and make a handsome annual profit in so doing."

Furnacemen will readily admit this and would welcome any reversal of conditions which will make this folly unnecessary. But does the Scotch warrant system actually offer a remedy? It is rather a change of bondage, and the new master will not prove easier than the first; it is a shifting of the burden of expense onto the consumer. If iron must be stored, better in the yards of the maker and owned by him, so that any legitimate profit which may attach in time will be enjoyed by him. When it is converted into a warrant the maker ceases to control it. He reaps his own sure profit, and others, interested only in speculative harvests, juggle with the market, often to the detriment of the consumer, as well as piling up charges. It often happens, too, that the producer suffers for letting his iron go. If the amount of metal put into warrants during dull times is very great, and comes into the hands of speculators to such an extent that they can dominate the market and fix the price, the maker is hoist by his own petard. The demand for iron may be good, but the speculative price for warrants is down, and he must meet the price to consumers, turn into warrants at that price, or store in his own yards, which brings him right back to the system prevailing here in America now, and demonstrates how little real

relief the Scotch plan offers. The maker finds himself in the absurd position of competing with his own iron.

The fact that, as a system, warrants have existed in England for "60 years without change, while constant changes have taken place in the systems of other countries," is the weakest of the arguments made for their adoption in this country. Blast furnaces are making pig iron to-day in England which were turning out metal 60 years ago; they have not been changed, some of them, perhaps, have not been relined in years. Changes have been made in American blast furnace practice, and we think that the modern furnace in this country is better than the antiquated scrap heap of two generations ago in England. But because English furnacemen are satisfied with their 60 years of changeless, protoplasmic existence, shall we then revert to a form of plant and a practice which has proved to be inadequate to the demands of this country? We might just as sanely be asked to change our methods of selling as our manner of making pig iron.

The Scotch warrant system does not afford greater stability for prices nor prevent violent fluctuations. It introduces a disquieting element which is a constant disturbance to the peace of the trade. It increases unnaturally the cost of iron converted into warrants. It does not solve the problem of taking care of consumer and producer in times of depression, but dodges the issue by shifting the burden from one to another. It does not lessen the evils of the iron business, but adds to them. Under the present system financially weak furnaces are often conveniently carried by their selling agents, and the cost of the hard times is proportionately sustained by the three factors, producer, consumer and middleman.

THE IRON TRADE REVIEW.

Referring to an article on the "Cost and Feasibility of Cupola Malleables," contributed by E. H. Putnam to a previous issue of this journal and reviewed in the A. F. A. Journal for February. Mr. P. H. Davis, of St. Charles, Ill., offers the following comments:

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Some of the statements made on this subject are so misleading that it probably causes others who are engaged in the management of the shop as well as myself, a great deal of worry as to how we are to produce malleable castings with the present price of labor, iron and other material that enters into their manufacture, at a cost of less than 2½c per pound, as stated, and I should be pleased to have Mr. Putnam publish the figures upon which he based his cost, starting out with pig iron and following with the other items which enter into the cost.

As articles of this kind are published, the employers of such men as myself undoubtedly hold these figures over their employes and wonder why it is that we cannot get men to work for nothing as would be necessary in this case, in order to produce malleable castings, such as are used in agricultural machinery, at a less cost than 2½c per pound.

I will state that for a term of 12 years I used a cupola in making malleable castings, but for the past 12 years have used the standard method of melting in a reverberatory or air furnace. Under no circumstances would I return to the old method of melting with a cupola; nor is there to-day any first-class manufacturer of malleable castings who pretends to use a cupola. As regards the matter of shrouding the manufacture of malleable castings in mystery, the process is open to anyone, and the margin of profit is so low that people who are actually acquainted with the cost of making castings are in no hurry to rush into the business. As with all other lines of business, the one way to manufacture and realize a profit is by giving strict attention to all of its details.

The Whitney Car Wheel Works of Philadelphia take exception to certain expressions in an article contributed to a previous issue on "The Chemist and the Foundry," by Edward Kirk (see A. F. A. Journal for February) and write:

We note the origin and resurrection of rumors whose acceptance without investigation detracts much from Mr. Kirk's plea for the real value of foundry chemistry. He appears to have

accepted as a terrible example of misapplied chemistry what we and others who know the facts appreciate as the third great step in the foundry department of our wheel business, the first being annealing or very slow cooling of chilled castings for first day in a preheated pit, and the second being the contracting chill ring, which was first applied at our works, and is now well known in various forms.

By our old economics of the chemical method and the high quality assured and by an improvement in annealing first applied here, we have been able to resume business in the face of rumors referred to. We therefore feel that though our name is not mntioned we have the right to shake such dirt from ourselves when an attempt is made to accidentally bury us alive under a general epitaph which may injure others as well; in fact, "quite a number of firms" who have failed at various times and for various reasons, always charged to the last medicine and not to the effects of the previous real disorders and overloads. We still employ the same "iron doctor," who is known to have prolonged our previous existence by at least three years, and we are not now doing business under a final epitaph. The principal facts are worth enumerating as throwing more light on Dr. Kirk's article and to show that it was not his fault that he did not know so much had already been done and kept fairly quiet for commercial reasons. And naturally, though of scientific and financial interest, we do not propose to enlarge upon that part of the subject at present.

1. From 1847 to 1872 the firm of A. Whitney & Sons frequently lost nearly entire heats of wheels on account of the metal not meeting their well-known high standard as to chill and strength. This was in the days when they and all wheel makers used only cold blast charcoal pig iron, very few old wheels and no chemistry.

2. From 1872 to 1881 they used steel in their mixture, with very unsatisfactory results, frequently losing large portions of a heat. Still no chemist to blame.

3. By 1885 they had returned entirely to charcoal irons but

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no mixtures were made on a chemical basis until 1889, when the carefully calculated experiments and a chemical system of control worked out by our Mr. Asa W. Whitney since 1884, aided by his previous furnace laboratory and foundry experience, proved itself decidedly in advance of the anxious "rule of thumb" method by its far more uniform success in the close prediction of results, while the iron making was still in the hands of the "practical experience."

4. Being in close touch with the foundry and laboratory, this system in his hands has ever since been the guide in buying and mixing irons and the results as to quality and economy have been entirely satisfactory; the laboratory expenses being less than the former expensive trial melts and tests which did not always show what the metal in question would do in company with other metal in a mixture. There were considerable losses, it is true, at times, owing to iron contracts not in accordance with iron mixers' views and the stock on hand, and especially at one time (though nothing like those old-time losses) through the inefficient management of a superintendent. But this was at once remedied after he left.

5. When the works, which, instead of being "out of business," were turning out over 200 wheels daily, were closed by the assignee with $30,000 of orders on the books, all the wheels passed the rigid railroad tests, or in case of light wheels were accepted, and we have heard them praised since and are now filling similar orders. There was no accumulation of wheel scrap, as all cupola return was always promptly used up.

6. In January, 1899, manufacture was resumed and with expressions of gratification on the part of many of our old customers at being able to get our wheels again.

7. During our temporary stoppage our Mr. A. Whitney applied his method at a soft iron foundry where the firm and their chemist had become equally discouraged. That chemist became as pleased as his employers and we understand his position is now secure.

8. Some other car wheel works use some chemistry with

more or less success, and one concern older than ours is, we understand, at last preparing to go into the matter thoroughly. We have never heard of a case of business failure in the foundry line caused by "infatuation" with chemistry, but can imagine that some conditions which would ruin a business would make the application of any chemical system impossible.

9. In a large foundry it is entirely impracticable to expect the analyst to combine his sufficient duties with that of a careful calculator of mixtures and their almost daily adjustments, of close advisor to the iron buyer and of a foundry expert. All but the analyst's business should be the duty of the foundryman (and assistants, if necessary), and with a proper system it is merely a matter of convenience and safety to have the analyst at the foundry as well as at the blast furnace, as blast furnace sampling is usually sufficient to sell and buy on but not often to figure very closely upon.

"The Fracture of Pig Iron" is an article contributed to the issue of Feb. 15 by Edward Kirk, and as the subject is one which appeals to all foundrymen we reproduce it in full:

It has been the practice of foundrymen and blast furnace men, for many years, and we might say ever since pig iron was first produced from a blast furnace, to judge and grade the iron by the fracture of a freshly broken pig. This practice of grading iron is now being rapidly replaced by grading from chemical analysis, which will no doubt prove more accurate to the majority of foundrymen. Yet a practice that has been in vogue for so many years must have some merit, and a few points from the old school may be of value to the foundry chemist, as well as to foundrymen.

The characteristics of pig iron are as accurately indicated by the fracture, to the man who has acquired the art of judging iron by fracture, as they are by chemical analysis. This may seem a radical statement to the strong advocates of chemical analysis, but it is none the less correct. There are many castings in existence to-day, made many years ago, for which the iron was chosen

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by fracture, that are in no way inferior to those made by chemical analysis, and in many cases superior to them. There are foundrymen to-day to whom the practice indicates as accurately the characteristics of an iron as does a chemical analysis. The uncertainty of judging irons by fracture comes not from the fracture not accurately indicating the characteristics of the iron, but from the foundryman not being able to judge its characteristics; in fact, few foundrymen have given the matter of fracture sufficient attention to become fracture experts.

Among those whom the writer has met, who may be classed as fracture experts, was Frank Lawrence, for many years foreman of the American Stove & Hollow Ware Co.'s foundry, and for more than twenty years and up to the date of his death a few years ago, the iron and cupola expert of the Isaac H. Shepherd Stove Works, Philadelphia, Pa. Mr. Lawrence could look at and feel the fresh fracture of a pig and say accurately whether it would or would not make a soft, strong stove plate. And he could determine in the same way, whether two or more irons when melted together would produce a soft, strong plate, and was never known to fail when left to use his own judgment of irons. He was one of the first foundrymen to use high silicon, or silver-gray iron, as it was then called, in a stove plate mixture and melted many tons of it, when other founders condemned it as a worthless rotten iron.

Another expert of iron fracture is Thomas Magee, foreman of the Bushill Iron Works for many years and up to the time the works were closed, to make room for the new United States Mint now being built at Philadelphia. The specialty of this works was large rolls for rolling mills, and the success of the business which enabled the proprietor, Mr. Moore, to retire with a fortune was largely due to Mr. Magee's knowledge of iron fracture, which enabled him to turn out rolls of any required degree of softness, hardness and strength.

There are no doubt many other fracture experts employed in the various foundries throughout the country. They will generally be found in foundries making a specialty that requires a good

quality of iron. The writer has met with some success in judging irons in this way, although by no means an expert, and many old foundrymen in different parts of the country will remember that he melted in their foundries iron which had been condemned and had lain in the yard for years. One of the successes in this line was at the Union Stove Works, Peekskill, N. Y., in 1876, when a large lot of iron which had been condemned and had lain in the foundry yards for five years or more was melted with another iron, said to be inferior, and a good soft strong iron for stove plate produced. Neither one of these irons had ever been seen or melted before by the writer, and the mixture was made from the indication of the fracture without previous knowledge of the characteristics of the iron. Other successes met with were at the foundries of Perry & Co., and Rathbone, Sard & Co., Albany, N. Y., in 1876. The irons used at these foundries at that time were Crane, Allentown, Thomas, Hudson and Jager. These irons Nos. 1 and 2 had been used for years in the stove foundries in this locality and produced a soft, strong plate, but they had suddenly begun to run hard, while the fracture to all appearance indicated the same characteristics as when they ran soft. A mixture of these irons in various proportions produced an uneven, hard plate. The hardness was first attributed to one iron and then to another, which in turn were left out of the mixture, and finally to the No. 2, which was all left out, and at the foundry of Rathbone, Sard & Co. only No. 1 Crane, Allentown and Thomas were being used when the writer visited their foundry.

This mixture of No. 1 irons produced what the writer termed a sandwich iron, from the tendency of the hard iron to separate from the soft iron and form in a thin plate between two thin plates of soft iron. This frequently occurred over a large surface in plates not more than 3-16-inch in thickness. It would also separate from the soft iron in heavy parts such as lugs and one lug of a door or side might drill perfectly soft and free, and another drill free part way through, when a hard iron would be found that could not be penetrated with the drill.

This characteristic of these No. 1 irons was afterwards found

to be due to an attempt by the blast furnacemen to reduce the cost of their product by using a cheap Jersey ore, the iron from which did not unite with the iron from their other ores. To overcome this difficulty, it was suggested to Colonel Young, the foundry superintendent, and a foundryman of many years' experience, that the fracture of the No. 2 iron indicated a softer and more even iron than the No. 1, and that a mixture of all No. 2 Crane, Allentown, Thomas and Jager be made. The Jager iron had been condemned and not used for some time, and the idea of making a mixture of this iron, the No. 1 of which was said to run hard, with all No. 2 of the other brands, which were also said to run hard, was too absurd to be seriously considered by the Colonel. But after some success had been met with in melting Jager and No. 2 at the foundry of Perry & Co., the Colonel, not having improved on his mixture, was induced to try a charge of the above for grates and fire backs. This proved so satisfactory that an entire heat was melted from the mixture and a soft, strong, even plate produced.

Numerous other instances might be given of judging by fracture irons never seen before, but these are probably sufficient to show that the characteristics of iron are indicated accurately by the fresh fracture. Irons are generally judged by the color, size, shape, brightness, dullness, smoothness, sharpness, and regularity of the crystals in the fracture of a newly broken pig. A dark color is said to indicate a soft iron; a light color a hard iron; a large crystal, a soft iron; a small crystal, a close or hard iron; a bright iron, a fluid iron; a dull crystal, a non-fluid iron; a smooth crystal, a weak iron; a sharp pointed crystal, a strong iron; and an irregular crystal, an uneven iron that will run hard in spots.

The majority of foundrymen judge iron by these characteristics, and they can generally predict very accurately from them in irons to which they have become accustomed, any change that may take place in the castings. But the majority of them cannot judge accurately irons, the fracture of which they are not familiar with, and for this reason they are very slow to try new brands of iron. They frequently pay $1 or $2 a ton more for iron than the

price of an equally good iron. The reason why they are unable to judge one iron as correctly as another, is that different ores impart to iron a peculiar characteristic, that is apparent to those who have not made a study of fracture in different brands of iron. This is illustrated in the case of the Crane, Allentown and Thomas irons above referred to. The Colonel was able to judge these irons correctly, so long as the same ores were used, but when a change was made in the ores he was all at sea, and increased the quantity of hard iron and decreased the soft, in his mixture, when a soft iron was desired. It may be asked, were not the No. 1 and No. 2 irons made from the same mixture of ores, and should they not have presented the same characteristics? They were made from the same ores and may have been made from the same cast in the furnace, yet they present entirely different fracture characteristics to the close observer and gave entirely different results when remelted. In the No. 2 the hard iron had blended and united with the soft iron, while in the extremely soft No. 1 it had not united and when remelted separated from it in the casting. This phenomenon in iron will be explained when melting shot and burned iron. The furnacemen, at whose furnaces these irons were made, employed chemists to ascertain the cause of this peculiar characteristic of the irons; but they were unable to determine the cause, or suggest a remedy. And it is doubtful, even with the advancement made in the chemistry of iron at the present time, whether a chemist would meet with any more success in handling this peculiar iron; for I do not think an analysis would show that the hard iron would separate from the soft when remelted.

To attempt to illustrate the characteristics of fracture in pig iron, would only be a waste of space, for neither the artist, the engraver, nor the press, can reproduce them on paper in a way that would be of any value to the reader. To attempt to describe them so minutely as to enable the reader accurately to judge an iron would be equally useless, but a few points on the fallacies in fracture may be of value:

The sow and the sow end of a pig shows a larger crystal and more open iron than the tail end of the pig. The pig when broken

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in the center is said to show the average crystal of the pig and to indicate the quality of iron, but it does not always do so. The iron may be more accurately judged by breaking the pig near the ends and comparing the fractures. If the sow end indicates a very soft iron, and the tail end a hard or very close iron, the iron will run hard in a light casting, and harder in a heavy casting some distance from the gate than near it. A sharp-pointed draw-out crystal indicates a strong iron. This may be deceptive, as the shape of the crystal can be changed to some extent, by the way in which the iron is broken. A pig broken with numerous light blows will show a sharper pointed crystal than the same pig when broken with one heavy blow. This of course does not apply to high silicon irons, that break at the lightest tap of the sledge. A dark bluish fracture shows a soft iron, and a light silvery fracture a hard iron. This is changed by the presence of silicon, and a light colored crystal may indicate a softer iron than a dark one; but the dark fracture is the stronger and better foundry iron. A high silicon iron without crystal and a white hard iron present similar fractures and are distinguished from each other by the silicon or soft iron having a light bluish cast and a dull ring. while the hard iron has a whitish cast and a sharp ring.

Referring to the National Founders' Association, and the problems it is solving, the Iron Trade Review has an editorial in its issue of Feb. 8 as follows:

Whether or not the consolidation movement has facilitated the progress of the association idea among individual manufacturers, it is a fact that the latter is making more rapid progress than ever. Perhaps it would be coming closer to the logical order, as well as to the facts, to say that the associations that have been at work in various lines of manufacture in the past twenty years made easier the work of bringing together competing companies, that has been so prolific an industry in the past year. And now that consolidations are so numerous, it is not difficult to believe that manufacturers in the manifold lines in which single and competing establishments will long continue to be the order, are finding

fewer obstacles to associated effort for the maintenance of uniform practices and the correction of abuses.

The rapid growth of the National Founders' Association, which has just held its second annual convention in Detroit is a case in point. From a membership of less than 100 last year, it now has 275 foundry firms enrolled, employing more than 15,000 molders. Measured by capital represented, the strength of the association has more than trebled in the year. Another movement on similar lines has been under way among machinery and boiler manufacturers and forge shops, the organization being known as the National Metal Trades Association. Like the National Founders' Association and the Stove Founders' Defense Association, the machine shop, boiler shop and forge shop proprietors are coming together for the handling in an amicable way, of all questions affecting employes, and for mutual protection against any unjust demands that may be made by labor organizations.

Those unfamiliar with their operations sometimes regard such associations as designed to fight organized labor and to keep down wages. So far as we have observed their workings they seek rather the amicable settlement of wage disputes, and not only favor good wages, but seek to maintain them by securing the nearest approach possible to uniform conditions. Peace rather than war is the normal state with these associations, as with nations; and as with the latter the best guaranty of peace is thorough preparedness for war—this state of preparation aiming always at peace and not at war. As was well emphasized in one of the addresses at Detroit last week, while just dealing is the foremost aim of the movement, no individual and no organization is in position to deal justly unless it be strong to enforce justice. Strength secures respect; and there has been no greater factor in the relations between the molders' and the founders' organizations the past year than that the manufacturers' representatives could guarantee the enforcement of an agreement in their own ranks, and on the other hand could put their aggregated strength behind the cause of any member against whom unjust demands were being pressed.

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The past year has brought much friction between molders and founders. Wage advances have been granted with little or no attempt to deny them, on the principle that wages should advance with the prices of products. But other questions are pending which in the present year may be pushed to the fore more aggressively. The most hopeful sign about the situation is the spirit of conciliation that has appeared in the conferences between officers of the two organizations. It cannot be said that much advance has been made to common ground on the questions of unionizing shops, piece-work abolition and control of molding machines by the union. On the question of minimum wage there is no agreement as yet, but the conferees could not help feeling that it were better to have met and disagreed than never to have met at all. The defect of the union position on this point is radical. It amounts to a demand for a definite sum per diem for the poorest workman, with advances for more skilled men, but a refusal to specify what degree of skill shall be possessed by the man who receives the stated minimum. It is an attempt to divorce the wages from the service performed, which, coupled with the demand for piece-work abolition, savors very much of an effort to secure a maximum of pay for a minimum of work. In a day when there is every form of competitive pressure upon the manufacturer to secure a maximum of output at a minimum of cost, it is simply turning the clock back to enforce an opposite rule in respect to labor. Here is the weakest spot in the molders' organization to-day—its tendency to reduce labor to its lowest efficiency.

The coming year holds some possibilities of strife in the foundry trade. There is no disposition on either side to disguise the fact. The strong, conservative forces on both sides will all be needed if the outcome is to be gain and not loss. It may be that a great price may have to be paid for ultimate peace on a basis of equity; only time can determine this. This much is certain: So far as the manufacturers are concerned, the solution of present problems is being undertaken with a full determination to make justice and not sheer force the basis of their contentions. That is a platform that deserves to win.

THE TRADESMAN.

Writing of "The Man with the Machine," E. H. Putnam says:

The molder has not been hunting for a job very numerously of late. He has, rather, been spending a good deal of time in deciding which job he will accept. If, as some people assert, he is a commodity, consumptive capacity and transportation facilities have become so augmented as to render him, practically, a less perishable commodity than formerly. And so, when, according to the laws of supply and demand, his price rises, we pay it, because our refusal does not, as once, consign him to starvation. When the price of coal, bread, beef or broadcloth rises, we crack a spiteful joke, pay the price and laugh! but how we do go on when the price of man rises! And now, come to think about it, have we suffered any in purse because of the recent rise in the value of labor? Of course, I grant ye, that we have had to get down off from our high horse and say "Howdy" to the laborer, and act just as if we regarded him as being one of us. But, if we hadn't ever acted in any other way, even this would not have given us a pain. And now, if the employer and the molder both do the right thing with regard to the molding machine, the machine will prove an immediate benefit to both, and an ultimate good to general society. Let us examine the status of the situation for a moment, from the standpoint of men who, we assume, wish to do what is right. And we certainly must do the right, finally, because all the dominant forces of creation converge to that one point.

The molding machine simplifies labor; shall the time wages of the operator, therefore, be reduced? Let us see. Has the improvement of the engine lathe tended to reduce the wages of the lathe hand? Has the perfecting of the steam engine resulted in reducing the wages of the engineer? Does the manipulator of the typewriting machine receive less wages than the former amanuensis? No; but they all produce much more than formerly, and the value of their wages is somewhat greater. That is

to say, they, in common with everybody else, have been benefited by the employment of labor-saving machinery.

The molding machine in operation is the equivalent of a certain amount of human labor, and the hired operator of the machine has no valid claim to the value of that equivalent. The machine does not belong to the operator; it is the property of the employer, to whom rightfully belongs the full value of that part of the product which is the result of using the machine. And the machine will be employed in spite of all opposition. This fact, the molders have at last taken cognizance of. But the molder insists that he has a right to a word concerning the conditions of its use. Shall hatred, or love, rule in the relations of the employer and workmen anent the use of the machine? If hatred, then it is certain that the immediate victor will but have thrown a boomerang that will come back sooner or later, without any diminution of force. Who can doubt this? Have we all passed through the experience again and again?

What is it that makes the labor unions so powerful to-day but the reflex influence of injustice practiced upon individual workmen in the past? No such thing as trade union would ever have been known but for the injustice that some employers always practice toward their workmen when they have the power. Men, and especially the poor, will bear much, even of injustice and oppression, before they will resort to expensive and laborious organization for defense. And every unjust hardship that shall be put upon the workman will tend inevitably to cement the bonds of union, and solidify the trade organization, and will render him doubly able and thrice apt to retaliate at the opportune moment. If, in introducing the molding machine, the employer ignore the molders' interests and rights, he will thereby forfeit the good will of the latter, and invite retaliation, which will certainly find occasion for display. If the molders, on the other hand, resist the employment of the machine, and refuse to render to its owner its full value in use, they will thereby invite an expensive war, and final defeat. That there will be attempts at overreaching on the part of both parties to the controversy may not be doubted. Be-

sides, neither party comprehends fully all sides of the question. It is not in human nature to do so—self-interest stands in the way. One great stride has been taken toward the solution of the problem, however: The molder at last recognizes the validity of the machine's claim to the right of employment. The only question now is, on what terms shall it be employed? The employer and the workman are exactly alike in character, disposition and nature—they each want all they can get for what they have to dispose of; and if either party to the bargain is ignorant the other will take advantage of him. But, in this case, speaking broadly, neither party is ignorant, but, on the contrary, both are keenly intelligent and alert.

The principal question that now divides the parties is as to what class of men shall be employed to operate the machines. As I read the molders' expressions on the subject, they demand that molders be employed, at a reduction in wages per unit of product sufficient to cover the value of the machine's service, while the employers claim the right to employ a less skilled, and therefore cheaper class of labor on the machine.

There is another very important feature of the situation which cannot be ignored. The molders, at the first introduction of the machine many years ago, fought it, just as trade guilds have always and invariably fought the introduction of that greatest material blessing that this world has ever known, the labor saving machine. And, as always, and forever must be, they lost the battle. But their surrender was conditional, however; they could not prevent the use of the machine, but they could and did refuse themselves to operate it. What was the result? Simply that many hundreds of unskilled workmen took the places that the molders had refused. And now the molders, at last recognizing their folly, ask to be given control of the machine, and that union molders only be employed as operators.

In some shops this state of affairs is now in operation. But the question is still open between the Iron Molders' Union and the National Founders' Association. How will it end? Well, we shall not cross that bridge for several years to come; for this

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is one of those troublesome questions, of obscure outline, like the boundary between Alaska and the British northwest territory; and if our best statesmen cannot settle upon the latter, what can we expect in the former case? But I do not doubt that both parties to this controversy believe in the justice of their several positions, and acrimony on the part of either side would tend to aggravation and waste of energy.

One thing is certain, viz., if the molders' union cannot get control of the situation in the many foundries where now unskilled labor operates the machines, it will have to yield up the whole case, finally, for the time will come when, on a declining market, stress of competition will compel an even basis of wages on the class of castings made on the machine.

THE FOUNDRY.

Paul R. Ramp illustrates an improved core oven and car.

R. H. Palmer shows in detail the molding of a lathe bed.

In an article dealing with the location of the foundries in the United States this journal says: Statistical information is always more or less interesting when it concerns one's own trade. From an exceptional careful canvass which we have recently made we find that there are four thousand one hundred and forty-five (4,145) foundries in the United States in which iron is melted. These range all the way from the small country plow shop, running maybe a heat once in three months and sometimes even less, to the big concerns melting hundreds of tons daily.

All the states and territories of the Union are represented as consumers of pig iron with the single exception of Wyoming, in which state we have failed to find a foundry of any kind. Even far off Alaska is credited with one foundry located on Douglass Island. This shop is operated by a mining company, who doubtless conduct it more for the sake of obtaining repairs in short or-

der than for the actual profit to be found in the business itself. Certainly pig iron and coke must come rather high in the neighborhood of the Arctic circle, and it would seem as if, eliminating the question of time, castings could be purchased cheaper than they could be made.

Although small shops are as yet in abundance in all parts of the country, flourishing with more or less success, nothing is more certain than that the real old-fashioned backwoods foundry, which makes a living by trading a few plow points and other repairs for a load of wood with an old stove thrown in, is doomed to extinction. In the first place these shops in the majority of cases do not understand their business. Their product is hardly ever satisfactory. In trying to make castings without buying any pig iron they naturally strike a snag. Again, the transportation facilities of the country are constantly being improved and repairs can as a general thing be promptly obtained. A third cause operating against the small shop is the inclination of manufacturers not only to have repairs ready for immediate delivery, but also to dispose of these at reasonable prices. There was a time when the manufacturer attempted to obtain extortionate prices from those who purchased his machinery and were unfortunate enough to need extra castings afterwards. In doing so he hurt his own interests and destroyed a source of revenue, for repairs can be readily disposed of at a fair profit and still be sold at a great deal smaller price than would suffice for the jobbing shop, which must make single pieces where the original manufacturer has all the advantage of turning out work in large quantities on the interchangeable plan.

According to the number of iron foundries they contain, the states rank as follows: Pennsylvania, 646; New York, 515; Ohio, 400; Illinois, 298; Michigan, 230; Indiana, 185; Wisconsin, 173; Massachusetts, 169; New Jersey, 136; Iowa, 101; Connecticut, 98; Missouri, 95; California, 88; Minnesota, 87; Virginia, 71; Tennessee, 61; Alabama, 56; Kansas, Maryland and Texas, each 55; Kentucky, 53; Georgia, 50; Maine, 46; New Hampshire, 36; North Carolina, 35; West Virginia, 34; Vermont,

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33; Colorado, 30; Rhode Island, 29; Nebraska, 27; Louisiana, 23; Washington, 22; Arkansas and Oregon, each 18; South Carolina, 16; Mississippi, 15; Delaware and Utah, each 12; Florida, Montana and South Dakota, each 8; District of Columbia, 7; Arizona and North Dakota, each 6; Nevada, New Mexico and Oklahoma Territory, each 4; Idaho, 3; Indian Territory, 2; Alaska and Hawaiian Islands, each 1.

The five states of Pennsylvania, New York, Ohio, Illinois and Michigan have 2,089 foundries, or a little over fifty per cent of the total. In geographical location fourteen southern states, including Arkansas, Maryland, Texas and West Virginia, have 550 foundries, or nearly a hundred less than is to be found in Pennsylvania alone, the latter state more than proving its claim of being the banner domain of Uncle Sam in iron manufacturing and leading New York by 135 foundries.

The fourteen northern states laying east of the Mississippi and north of the Ohio, excluding Delaware and the District of Columbia, have within their borders 2,944 foundries, or nearly seventy-five per cent of the total number. While the southern states have made great gains it is to be noticed that the foundry interests of the northern states have advanced at an even more rapid gait.

Chicago leads as the principal center of foundries in the United States, having 83 iron foundries to its credit, Philadelphia being second with 75, and Pittsburg third with 54. New York and Brooklyn together have 73 foundries. In point of numbers the foundries of Chicago equal the total to be found in fifteen states and territories. In point of volume of trade, or in other words, taking into consideration the amount of iron melted, the Chicago foundries equal the total output of about twenty states. All the foundries of Virginia, the leader of the southern states, could be placed in Chicago without causing a ripple and it would require those to be found in the state of Delaware to balance the scale in point of numbers.

In "Cast Iron Notes," Mr. W. J. Keep answers some questions on the following subjects:

SHAKING OUT CASTINGS HOT OR COLD.

Question.—I would like to ask whether it adds to the strength of common agricultural gray iron castings to leave them in the sand until perfectly cool, or is there any advantage gained over the ordinary practice of shaking out hot? Our test-bars go to show that those shook out hot are slightly stronger.

Answer.—It does not make much difference in strength when small castings are removed from the mold if they are not red hot. The slower a casting cools from the fluid state until it ceases to be red hot the larger will be its grain. Strength depends almost entirely on the size of the grain and on the firmness in which they knit together, therefore, as your test-bars show the castings, removed while they are red hot will cool faster and will have a slightly smaller grain and be a little stronger.

The reason for leaving a casting in the mold is not to make it stronger in the way a test-bar shows it, but is to prevent warping or the formation of internal strains. By slow cooling after the casting ceases to be red hot the particles have time to adjust themselves, and have a less tendency to pull apart. A casting that would crack if shook out hot would not crack if left in the mold until entirely cold. The casting as a whole is therefore stronger, while the metal itself is slightly weaker.

In castings having heavy and light portions it is sometimes necessary to leave some portions covered and to scrape the sand away from other parts. The whole object is to so cool a casting that internal strains are avoided.

HARD SPOTS IN CASTINGS.

Question.—I am troubled in some heats with hard spots in castings that vary in size from 1-16 an inch round to ⅜ an inch. They are round like a bullet and double extra chilled, while the casting all around it will be soft and the round bullet can be dug out with chisel. It is so hard the lathe tools will not cut it. I use one-half No. 2 foundry pig and one-half apparently good scrap for the ordinary run of work, and on thin work I use more pig, and on very heavy chunks more scrap. The cases referred to were in heats that were charged half and half.

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At first, three years ago, I was troubled with hard iron by not using enough pig. It seems to me that if a small piece of chilled iron got mixed up in the scrap and it was melted good it should mix in the ladle and neutralize with the pig iron. Will chilled iron mix with good pig without stirring in the ladle?

Can a heat of chilled iron be run by mixing three-fourths pig and get castings with uniform grade that can be worked in a lathe?

Answer.—It looks as though the iron spattered as it entered the mold and that the round drops were surrounded by the hot iron that afterward filled the mold. Such balls are often covered with a film of oxide which prevents the hot metal from melting it. When the casting is cold such balls of hard, suddenly-chilled iron will be found loose in cavities of the casting. This may be the cause of hard spots in castings. Just a slight variation of an iron mixture will often remove the tendency of iron to cool with all its carbon combined. A slight increase of silicon will often remove all white spots. If you have a small piece of chilled iron among your scrap and it is thoroughly melted it will mix and will have no influence on the casting.

A chilling iron will be very likely to run white in a thin casting, but in a heavy casting it will run gray if there is enough silicon present. To give a good chill the silicon is kept low and such iron will be hard. You can soften it just as much as you please by increasing silicon. It is hardly ever necessary to stir melted iron in a ladle, as the tendency is to mix without it.

The proportion of pig or scrap has nothing to do with the case. You can make just as good castings with all pig or scrap if the silicon is proportioned right to produce the required quality of casting.

If there is not enough silicon in either scrap or pig iron you must add what is needed.

MELTING IRON WITH CHARCOAL.

Question.—A party offers to make me a quantity of charcoal (from hard maple). Can you inform me if I can successfully use

it in the cupola for melting iron. Supposing the price to be not more than coke per ton, would it be cheaper?

Answer.—You can melt iron in a cupola with charcoal, but will have a great deal of trouble. It is not strong enough to hold up the iron, and it would take a great deal more than coke. You would have to use a very mild blast and would blow a large quantity of ignited charcoal out of the top of the cupola, which would be likely to set your building on fire. From your question you seem able to get coke, but would like to leave your money at home if charcoal would be as good. Don't try it. Coke is the best fire for melting iron.

ALUMINUM MIXED WITH CAST IRON.

Question.—Do you advise the use of aluminum in cast iron, what per cent for thin work say one-quarter to one-half, and does it add to the strength and toughness? We are going to cast some gasoline engine cylinders and want a good, strong casting. The thickness of the casting varies from one-quarter to one inch.

Answer.—I would not advise the use of aluminum in your case. In the first case it is expensive and silicon is as good. The action of each material is the same, although it is necessary to use only one-third as much aluminum as of silicon to produce a certain effect. You can purchase silicon at nearly the price of pig iron by purchasing pig iron that contains a little more than the ordinary amount.

An increase of silicon will produce sound, smooth castings. If you use too much you may find that the thicker portions of your casting will be spongy, in which case you must use more scrap. Somehow it has been imagined that aluminum was a strong metal, and that it imparted its own strength to iron to which it was added; but this is not the case. When aluminum is added to iron that is too hard it will soften it by changing combined carbon into graphitic. If the iron was brittle, it would take out the brittleness; but silicon will do the same.

Don't forget that strength is due to the kind of grain the iron has, and by varying the mixture of irons you can find a mixture that will be stronger. Then for softness increase the irons that contain the most silicon.

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